

KEYWORDS

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Brazil: how macroeconomic variables affect consumer confidence

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I dentifying which macroeconomic variables underlie consumer confidence is an essential step towards implementing sound economic policies. This article contributes to the subject by way of an empirical analysis based on ordinary least squares (OLS), generalized method of moments (GMM) and vector autoregression (VAR) techniques for the case of Brazil. The findings indicate that following a loose fiscal policy which increases public debt and taking measures to increase the volume of lending to the private sector does not represent a good strategy for improving consumer confidence. Moreover, the credibility of inflation targeting is a very important driver of consumer expectations. Working to enhance credibility is thus a key step for economies seeking to attain a high level of consumer confidence.

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I

Introduction

In late 2008, the world experienced the greatest economic crisis since the Great Depression of 1929. The origin of the crisis was financial but its effects on the real economy have spread around the world. The threat of a deep recession in economies such as the United States, Europe and Japan has created a wave of global pessimism. Falling equity market values have forced the postponement of investment decisions by firms, thus further contributing to the decline in economic growth. Another important reason for this negative sentiment has been the decline in aggregate consumption, which broadly speaking has mainly been the result of two factors: the fall in world stock markets, led by the slide on Wall Street, and a reduction in the credit available to consumers.

The first of these factors underlying the decrease in consumption has operated through the wealth effect, the point being that a fall in share prices reduces consumers' current income. The second factor came about because of a crisis of confidence. Owing to a lack of confidence in the solvency of the financial system, banks have adopted a conservative stance and the result has been a reduction in liquidity in credit markets. Consumption (especially of durable goods) has also been postponed, amplifying the precautionary character of the current economic environment.

In an attempt to obviate the problems of a deep recession, the central banks of industrialized economies (for example, the United States, the United Kingdom, Canada, Sweden and Switzerland) have cut interest rates in the hope of spurring economic activity. The expectation is that this mechanism will serve to create not only a stimulus to consumption but also an incentive to investment by reducing the cost of credit. Moreover, countercyclical fiscal policies, known as "rescue packages", have been used by the world's leading economies (Europe, Japan and the United States) to put the economy back on track. In short, there is now a consensus that it is not possible to wait for market forces to fix the crisis.

An important question that has to be asked in this environment is whether macroeconomic policies are capable of stabilizing the economy. Nowadays, macroeconomic policies are conducted with a view to guiding public expectations. In other words, the efficient conduct of economic policy depends on policymakers

taking account of public expectations about the future without pursuing time-inconsistent policies. At a time of imminent recession, therefore, identifying the key macroeconomic variables that affect household consumption and corporate investment decisions is crucial to the planning of economic policy.

The problems of the recession unleashed by the United States financial crisis have affected even economies that have no direct links to the financial institutions which have been declaring bankruptcy. In some emerging economies whose financial sectors have little foreign participation, in fact, the credit channel is not the main monetary transmission mechanism, and the number of stockholders is not great. However, this has not been enough to isolate these economies from the crisis. A good example is Brazil, one of the main emerging economies. The fear of recession comes through in President Luiz Inácio Lula da Silva's words of December 2008: "If you have debts, try to balance your budget first. But if you have some money put by or have just received your Christmas bonus, and you want to buy a fridge or oven, or change your car, do not forego your dreams out of fear of the future."

When economies plunge into recession, the main objective of policymakers is to minimize social losses by adopting economic policies that restore public confidence. In practice, since the spread of inflation targeting in the 1990s, expectations of behaviour have been a key variable in the system. Hence, identifying the macroeconomic variables that underlie consumer confidence is an essential prerequisite for implementing sound economic policies. This article contributes to our understanding of the subject by providing an empirical analysis of the Brazilian case.

It is important to note that the literature on consumer confidence normally evaluates the effect that a change in consumer confidence has on macroeconomic variables and focuses on the United States or European countries (see, for example, Fuhrer, 1993; Nahuis and Jansen, 2004; Ludvigson, 2004). There is thus a gap in the literature where emerging economies with inflation targeting regimes are concerned. Accordingly, there is a strong case for analysing the situation in Brazil, which is one of the most important emerging economies and also a potential test bed.

Since 1999, Brazil has applied accountable monetary and fiscal policies. The adoption of inflation targeting represents a clear use of monetary policy to guide public expectations. The last few years have been a time of stable economic growth, low inflation and improving social welfare. In short, it can be argued that the Brazilian economy is based on solid macroeconomic foundations. This paper

is organized as follows. The next section shows the relationship between consumer confidence and macroeconomic variables and presents the data for Brazil. Section III presents the analysis based on empirical evidence yielded by the ordinary least squares (OLS), generalized method of moments (GMM) and vector autoregression (VAR) techniques, and section IV concludes the paper.

II

Consumer confidence and macroeconomic variables

The standard analysis of aggregate consumption in textbook macroeconomics highlights two main macroeconomic variables, namely income and the real interest rate. In accordance with the Keynesian perspective, disposable income is seen as the main variable determining consumption. In other words, there is a positive relationship between disposable income and consumption. When consumers' intertemporal choices are considered, the real interest rate also plays an important role. An increase in the interest rate entails two competing effects on overall saving, a positive one through the substitution effect and a negative one through the income effect (Romer, 2006).

Household consumption decisions are not affected by income and real interest rates alone. It is true that an increase in output or a cut in the interest rate may affect aggregate consumption. Over and above this, however, it is necessary to ascertain whether variables associated with the conduct of economic policy are capable of affecting consumer expectations.

A variable that is important for consumer confidence is the volume of lending to the private sector. At times of crisis there is a tendency for credit to dry up abruptly, which in turn intensifies the recession. It is important to realize that this variable is directly related to the conduct of monetary policy. A central bank decision to cut the interest rate is an attempt to reduce borrowing costs. Thus, a decrease in the volume of credit leads to a fall in household consumer confidence.

Taking into account the argument of the Ricardian equivalence proposition, it is possible to make a connection between the conduct of fiscal policy and household consumption decisions. This very well-known proposition states that when a government adopts an

expansionary stance, consumption does not increase as a result. In the traditional Keynesian argument, on the other hand, the outcome is completely different. In this case, consumption is closely related to fiscal policy decisions. In other words, fiscal policy has the power to increase consumption.

Nowadays, a non-negligible variable considered by households in their consumption decisions is the credibility of monetary policy. This point has become increasingly important with the adoption of inflation targeting as a monetary regime by several countries since the 1990s. An important task of this monetary regime is to act as a nominal anchor guiding public expectations. In this context, central bank transparency is fundamental. "Central bank transparency could be defined as symmetry of information between monetary policymakers and other economic agents. High degrees of transparency reduce uncertainty, improve private-sector inferences about central bank goals and increase the effectiveness of monetary policy" (de Mendonça and Simão Filho, 2008, p. 117). Therefore, as pointed out by de Mendonça and Simão Filho (2007, p. 498), "transparency could increase the accountability of the central bank in its pursuit of targets, and thus increase its credibility too".

Hence, when the public expectation is that the inflation rate will match the inflation target, the central bank can reduce the interest rate without losing its control over inflation. In consequence, credit becomes cheaper and there is thus an incentive for investment and consumption in the economy to increase. It is therefore reasonable to assume a relationship between household consumer confidence and the credibility of monetary policy.

1. Data

Considering the arguments above and with a view to estimating the impact of macroeconomic variables on consumer confidence in Brazil, an empirical analysis was conducted using ordinary least squares (OLS), generalized method of moments (GMM) and vector autoregression analysis (VAR) techniques. The period of analysis runs from January 2000 to October 2008. The justification for using this period is that Brazil adopted a flexible exchange-rate regime in January 1999 and inflation targeting in June of the same year. Moreover, in late 1999 the Brazilian Treasury announced a strategy for managing public debt more credibly.¹ Therefore, 1999 represents a turning point for the macroeconomic analysis of the Brazilian economy. In addition, the market expectations series available from the Central Bank of Brazil (BCB) started in January 2000. The (monthly) series used in this study are:

(i) The index of consumer confidence (ICC). This index is calculated by the São Paulo Federation of Commerce (Fecomercio) and it evaluates the degree of confidence felt by the population in the general condition of the country and in current and future household living standards. This variable accordingly represents household consumer confidence in the empirical models. As can be observed in figure 1, the ICC rose until the beginning of 2005 and performed well from then on. The exception is the second semester of 2005. The fall in the ICC that year was due to weak economic growth (only 2.3%), representing a performance below the Latin American average.

(ii) Gross domestic product (GDP) at constant prices. This series is available from the BCB and corresponds to cumulative 12-month GDP as measured by the general price index-domestic availability (IGP-DI) for the month in millions of Brazilian reais. The GDP graph in figure 1 shows the path over the period.

In general terms, a trend of economic expansion is observed. Notwithstanding, 2003 was a year in which economic activity declined and 2005 saw a slowdown in economic growth. This variable is important to the analysis because much of the literature considers output to be a very important determinant of consumption. In short, an increase (decrease) in this variable is expected to entail an increase (decrease) in the ICC.

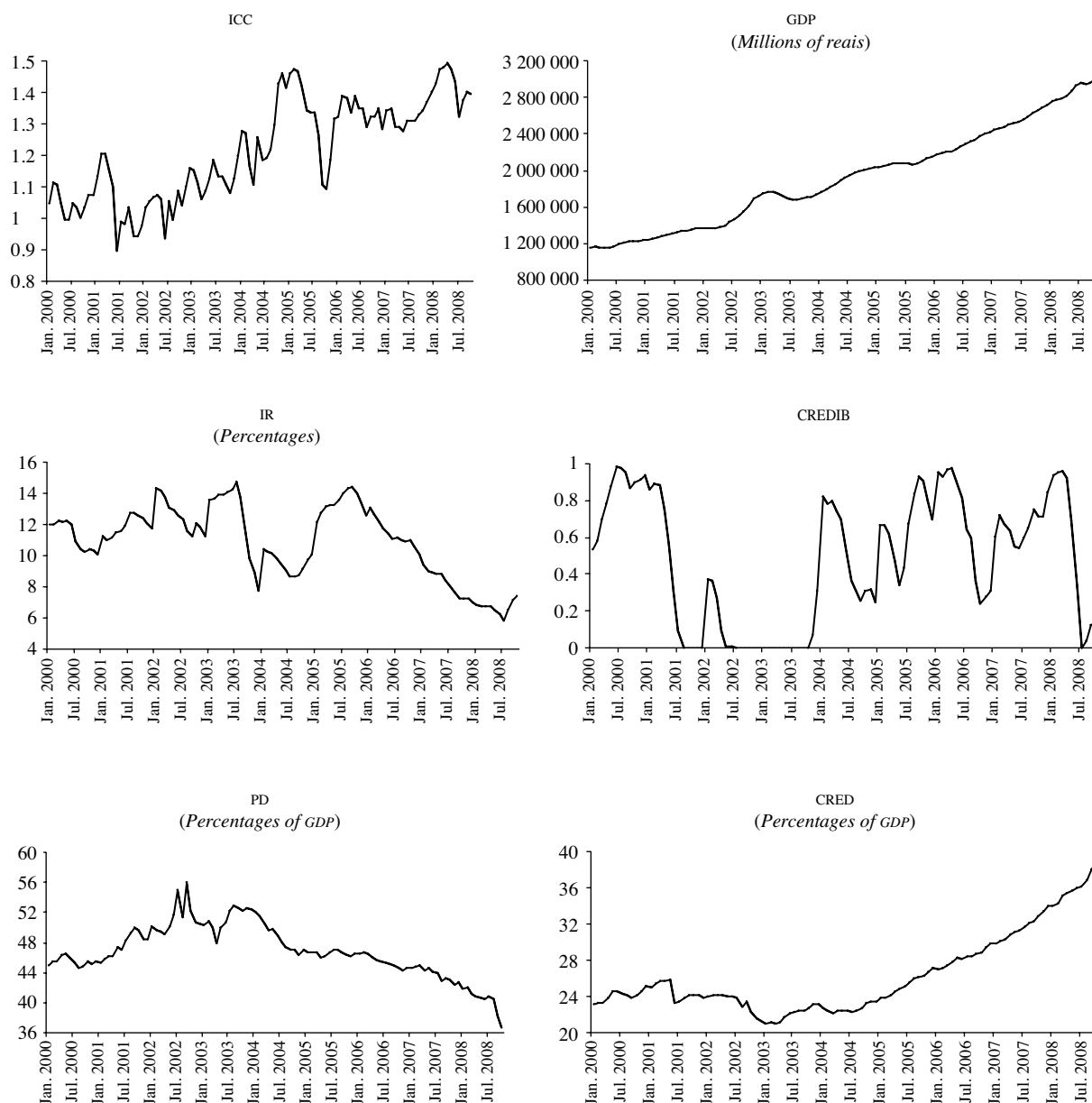
(iii) Real interest rate (IR). This series is calculated from the difference between the cumulative base rate (Over/SELIC) for the month in annual terms and annual inflation expectations, both of these series being provided by the BCB. Over/SELIC is the main inflation targeting instrument used by the BCB. Given that the real interest rate in Brazil is the highest in the world, any change in it alters public expectations about the present and future performance of the economy. Over a short-term horizon, any increase in the interest rate tends to lead to a decrease in output owing to the substitution effect from current to future consumption. Figure 1 reveals that only after 2005 did the real interest rate decrease. A possible reason for this behaviour over the last few years may be the success of the BCB in meeting the inflation target. Focusing on the effect of the real interest rate on the ICC, one would expect to find a negative relationship between these variables.

(iv) Credibility (CREDIB). The credibility index represents the credibility of the inflation target and is measured using the methodology developed by de Mendonça (2007). On the basis of the argument presented by Agénor and Taylor (1992) regarding the use of expected inflation series to derive a credibility index, the Cukierman and Meltzer (1986) definition of credibility and the suggestion made by Svensson (1999), we created a monetary policy credibility index that considers deviations in expected inflation ($E(\pi)$) from the core inflation target (π_t^c).² Incorporating the information made available by the BCB and the annual inflation targets set by the National Monetary Council, the credibility index is a result of:

¹ See de Mendonça (2007) for an analysis of the initial impact of the adoption of inflation targeting in Brazil. Regarding the strategy adopted by the Brazilian Treasury, see de Mendonça and Vivian (2008).

² The official price index used in Brazilian inflation targeting is the national consumer price index (extended) (IPCA).

FIGURE 1

Brazil: selected macroeconomic variables

Source: Central Bank of Brazil and São Paulo Federation of Commerce (Fecomercio).

ICC: Index of consumer confidence.

GDP: Gross domestic product.

CREDIB: Credibility.

CRED: Credit.

IR: Real interest rate.

PD: Public debt.

$$CREDIB = \left\{ \begin{array}{ll} 1 & \text{if } E(\pi) = \pi_t^c \\ 1 - \frac{1}{\pi_t^* - \pi_t^c} [E(\pi) - \pi_t^c] & \text{if } \pi_{tMIN}^* < E(\pi) < \pi_{tMAX}^* \\ 0 & \text{if } E(\pi) \geq \pi_{tMAX}^* \quad \text{or} \quad E(\pi) \leq \pi_{tMIN}^* \end{array} \right\} \quad (1)$$

The credibility index therefore presents a value of between 0 and 1 strictly if expected inflation is situated between the maximum and minimum limits (π_t^*) set for each year and takes a value equal to 0 when expected inflation exceeds one of these limits.

The performance of the credibility index is not stable over time (see figure 1). The worst performance was between the second semester of 2001 and the end of 2003. The reason for the practically null credibility of this period was a combination of several factors that held back the Brazilian economy. The main ones were the instability of the United States stock market, the losses incurred by United States companies and the crisis in Argentina, which drove away investment in emerging countries' bonds and thus produced a sharp rise in country risk. The exchange rate of the Brazilian currency also overshot owing to the political upheaval caused by the presidential election in late 2002. In short, 2002 and 2003 were marked by a failure to meet inflation targets. The inflation target in 2002 was 3.5% with a tolerance interval of $\pm 2\%$, and the actual inflation rate was 12.53%. After this appalling performance, the BCB adjusted the 2003 inflation target from 3.25% with a tolerance interval of $\pm 2\%$ to 4% with a tolerance interval of $\pm 2.5\%$. This change was not sufficient, however, and in January 2003, in an open letter, the BCB set a target of 8.5% with no tolerance interval. In spite of this, 2003 inflation was 9.3%. The credibility index performed poorly right up to the end of the period under analysis. The rationale for this result was that the Brazilian economy grew substantially over the period, giving rise to an imbalance between aggregate demand and supply. Moreover, the price of commodities, especially oil, put upward pressure on inflation.

The specific relationship between the credibility index and the ICC is that when credibility performs well, inflation is easier to control and thus there is less need to raise interest rates. When the credibility index is low, on the other hand, the effort that has to be made by the central bank (increases in the interest rate) to meet the inflation target is greater. A positive relationship between these variables is therefore expected.

(v) Public debt/GDP ratio (PD). This series is available from the BCB and is for total consolidated net public-sector debt as a percentage of GDP. Since January 1999, Brazil has been implementing a strategy to improve the public debt profile. One of its objectives is to lower the public debt/GDP ratio by gradually reducing the proportion of exchange rate- and interest rate-indexed bonds, while increasing the share of public debt made up of fixed-rate and price-indexed bonds. The path of the public debt reveals a deterioration in this ratio in 2002, when it passed the 50% mark, a level that continued to be exceeded until early 2004 (see figure 1). The acceleration in the growth of public debt was due to "market fears" about a possible victory for Luis Inácio Lula da Silva in the presidential elections. A speech in which the candidate expressed unorthodox ideas increased the risk perceived by investors and triggered a process of rising interest rates and currency devaluation. However, the victory of this candidate and the establishment of the new government in 2003 did not change the course of economic policy. As a result, fiscal efforts to reduce the public debt/GDP ratio were stepped up, and it has been falling ever since.

The connection of the public debt/GDP ratio with the ICC is that it acts as a proxy for government fiscal performance. An increase in this ratio means that the government is engaging in loose fiscal behaviour. Consumers may interpret this behaviour as necessitating a tight fiscal policy in the future, so that it may induce a fall in aggregate consumption. A negative relationship is therefore expected between the public debt/GDP ratio and the ICC.

(vi) Credit (CRED) represents total lending to the private sector as a proportion of GDP, and the series is available from the BCB.³ The volume of credit is important for decisions to bring forward future consumption. At times of credit rationing, the volume

³ It is important to note that although total lending to the private sector is used rather than lending to households, the difference is immaterial in this case because the correlation of the series for the period under analysis is 0.93.

of resources available is reduced and thus aggregate consumption (as well as the ICC) tends to fall. As can be observed from figure 1, lending to the private

sector increased considerably after 2004. A possible explanation for this path is the systematic reduction in the base rate by the BCB in the same period.

III

Empirical evidence

On the basis of the macroeconomic variables listed in the previous section, the equation for household consumer confidence is given by:

$$ICC = f(GDP, IR, CREDIB, PD, CRED), \quad (2)$$

with the expected signs for the relationships expressed through partial derivatives below:

$$\partial f / \partial GDP > 0; \partial f / \partial IR < 0; \partial f / \partial CREDIB > 0; \partial f / \partial PD < 0; \partial f / \partial CRED > 0.$$

Using the above-mentioned variables to estimate the ICC, the OLS and GMM methods were applied. The reason these methods were used is that they allow us to observe whether the propositions presented are applicable to the Brazilian economy. One reason for using GMM is that while OLS estimations have problems of serial autocorrelation, heteroskedasticity or non-linearity, which is typical in macroeconomic time series, this method provides consistent estimators for the regressions (Hansen, 1982).

As pointed out by Wooldridge (2001, p. 95), “to obtain a more efficient estimator than two-stage least squares (or ordinary least squares), one must have overriding restrictions”. The weighting matrix in the equation was chosen to enable the GMM estimates to be robust, considering the possible presence of heteroskedasticity and autocorrelation of unknown form. In addition, the use of instruments needed to be dated to the period $t - 1$ or earlier as a condition for predicting the contemporaneous variables which were unavailable at time t .

The variables in the regressions (except the ICC) are lagged on the hypothesis of strict exogeneity of the variables. This hypothesis would clearly be neglected if lags were not used, owing to the possible contemporaneous effect of the ICC on the other variables. The first equation (basic model), which estimates the effects caused by output and indirectly by the management of monetary policy (setting of the

base rate) on the ICC, treats GDP and IR as independent variables. Other variables were included to produce robust estimates. Five equations were estimated for the ICC on the basis of equation (2), taking the OLS and GMM methods into consideration:

$$(3) \quad ICC = f(GDP_{-1}, IR_{-3})$$

$$(4) \quad ICC = f(GDP_{-1}, IR_{-3}, CREDIB_{-1}),$$

$$(5) \quad ICC = f(GDP_{-1}, IR_{-3}, PD_{-1}),$$

$$(6) \quad ICC = f(GDP_{-1}, IR_{-3}, CRED_{-3}),$$

$$(7) \quad ICC = f(GDP_{-1}, IR_{-3}, CREDIB_{-1}, PD_{-1}, CRED_{-3}),$$

1. Analysis with OLS and GMM

The reported t-statistics in the OLS estimates are based on the estimator of Newey and West (1987), which is consistent in the presence of both heteroskedasticity and autocorrelation of unknown form (see table 1). Furthermore, as pointed out by Cragg (1983), overidentification analysis has an important role in the selection of instrumental variables to improve the efficiency of the estimators. With this objective, the GMM estimates apply the following instrumental variables in the regressions: constant, ICC_{-1} , ICC_{-2} , ICC_{-3} , GDP_{-2} , GDP_{-3} , GDP_{-4} , GDP_{-5} , IR_{-4} , IR_{-5} , IR_{-6} , $CREDIB_{-2}$, $CREDIB_{-3}$, $CREDIB_{-4}$, PD_{-2} , PD_{-3} , PD_{-4} , $CRED_{-4}$, $CRED_{-5}$, $CRED_{-6}$. An important property of the instrumental variables is their ICC-related exogeneity. A standard J-test was performed with the objective of testing this property for the validity of the overidentifying restrictions (Hansen, 1982). According to the results, all models are correctly specified (see table 1).

The estimates in table 1 reveal, for both methods (OLS and GMM), that the constant is positive and has a high statistical significance in all specifications. Regarding the effect from GDP to ICC, it is observed that although the coefficient is very low, it is positive and is statistically significant at the 1% level for all specifications. Therefore, as theoretically expected, periods of rising output tend to lead to an increase in the ICC. The effect caused by the real interest rate in

TABLE I

Index of consumer confidence (icc)
(OLS and GMM estimates)

Explanatory variable	OLS estimates					GMM estimates				
	Specification Eq(1)	Specification Eq(2)	Specification Eq(3)	Specification Eq(4)	Specification Eq(5)	Specification Eq(1)	Specification Eq(2)	Specification Eq(3)	Specification Eq(4)	Specification Eq(5)
Constant	0.8422 ^a [6.2400] (0.1350)	0.776324 ^a [5.5184] (0.1407)	0.9396 ^a [4.5185] (0.2079)	1.2011 ^a [5.2221] (0.2300)	1.8697 ^a [4.1736] (0.4480)	0.8576 ^a [11.8616] (0.0723)	0.5330 ^a [7.8539] (0.0679)	0.9865 ^a [6.1034] (0.1616)	0.9971 ^a [9.3936] (0.1061)	1.5679 ^a [4.9783] (0.3149)
GDP(-1)	2.38E-07 ^a [7.5082] (3.17E-08)	2.36E-07 ^a [8.8030] (2.68E-08)	2.32E-07 ^a [7.4215] (3.13E-08)	3.12E-07 ^a [6.4426] (4.84E-08)	3.29E-07 ^a [8.6958] (3.78E-08)	2.28E-07 ^a [11.3073] (2.02E-08)	2.55E-07 ^a [15.1321] (1.69E-08)	2.17E-07 ^a [9.1646] (2.36E-08)	3.87E-07 ^a [10.0386] (3.85E-08)	3.96E-07 ^a [17.6575] (2.24E-08)
IR(-3)	-0.0082 [-1.0552] (0.0078)	-0.005429 [-0.6827] (0.0080)	-0.0070 [-0.8250] (0.0085)	-0.0166c [-1.8738] (0.0088)	-0.0129c [-1.7288] (0.0074)	-0.0103a [-2.6610] (0.0039)	0.0111a [2.9935] (0.0037)	-0.0091b [-2.2152] (0.0041)	-0.0090c [-1.8879] (0.0048)	-0.0073c [-1.7129] (0.0043)
CREDIB(-1)		0.079776 ^b [2.3589] (0.0338)			0.0801 ^b [2.1452] (0.0373)		0.1456 ^a [9.0682] (0.0161)			0.1370 ^a [6.6309] (0.0207)
PD(-1)			-0.0021 [-0.5183] (0.0041)		-0.0110c [-1.9349] (0.0057)			-0.0026 [-0.9754] (0.0027)		-0.0065 [-1.5548] (0.0042)
CRED(-3)				-0.0158 ^b [-2.0854] (0.0076)	-0.0260 ^a [-3.2370] (0.0080)				-0.0182a [-4.5406] (0.0040)	-0.0301a [-5.7497] (0.0052)
F-statistic	118.5965	90.2214	78.6467							
Prob. (F-stat.)	0.0000	0.0000	0.0000							
J-statistic				0.0000	0.0000					
RMSE	0.0882	0.0839	0.0881	0.0811	0.0700	p>0.68	p>0.69	p>0.65	p>0.77	p>0.69
Adjusted R ²	0.6975	0.7241	0.6955	0.7420	0.8038	0.0925	0.0913	0.0929	0.0942	0.0777
						0.6504	0.6635	0.6433	0.6430	0.7484

Source: author's estimates.

Marginal significance levels: ^a denotes 0.01, ^b denotes 0.05 and ^c denotes 0.1. Standard errors in parentheses and t-statistics in square brackets.

GDP: Gross domestic product.

IR: Real interest rate.

CREDIB: Credibility.

PD: Public debt.

CRED: Credit.

RMSE: Root mean square deviation.

most of the specifications is not robust when OLS models are considered. On the other hand, the analysis with GMM models indicates that this variable is important in explaining the ICC. The predominantly negative sign bears out the idea that increases in the real interest rate inhibit household consumption decisions.

By contrast with the negative effect of the real interest rate on the ICC, credibility is a variable that plays an important role in improving consumer confidence. Both OLS and GMM estimations indicate that the coefficient of credibility is positive and has a strong statistical significance. This outcome is in agreement with the theory and indicates that the success of inflation targeting is crucial to household consumption decisions.

The inclusion of public debt in the model reveals that this variable is not relevant as an explanation for the ICC. Although the sign of the variable is negative and thus indicates that a fall in the public debt/GDP ratio contributes to an increase in the ICC, most of the models did not show statistical significance. As regards the effect of credit volumes on the ICC, an apparent puzzle is identified: the sign of this variable is contrary to what would be expected in theory and all specifications indicate that the coefficients are statistically significant. A possible explanation for this result is that an increase in the volume of credit also represents an increase in the number of households in debt and this, combined with the high interest rates prevailing in Brazil, erodes consumer confidence.

2. VAR analysis

Since there is a connection over time between the variables applied in the foregoing analysis, it is useful to extend the study by carrying out a VAR estimation. This method makes it possible to analyse the dynamic impact of random disturbances on the system of variables. Impulse response analysis in particular is attractive because it allows us to evaluate the response of the ICC to shocks (or innovations) generated by residual variables over time (Sims, 1980). Because the best specification for forecasting the ICC is given by equation (5) for both the OLS and the GMM methods, the set of variables used in the VAR analysis is represented by GDP, IR, CREDIB, PD and CRED.

Before the VAR estimation, the unit root tests, namely the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), were carried out. The results of both tests confirmed the null hypothesis (non-stationary series) for the original values of the series

under analysis. In the case of first difference, on the other hand, the null hypothesis is rejected at the 1% significance level, and thus the series are stationary (see Appendix, table A.1). Therefore, all series in this analysis are I(1).

The choice of the VAR lag order was determined using the Akaike (AIC) and Hannan-Quinn (HQ) information criteria. It is observed that both models (with and without constant) indicate that the lag order for VARs is 2 and that the best-fit model is with constant (see Appendix, table A.2). Furthermore, the residuals were normally distributed. The outcomes of the unit root tests indicate that the use of the first difference of series in the VAR is correct; however, this manner of proceeding can result in the long-run relationships between series being lost. Hence, it is necessary to ascertain whether a linear combination between series is stationary even if individually series are non-stationary. In other words, we need to see whether series are cointegrated, because in this situation it is advisable to use vector error correction (VEC) in the estimations.

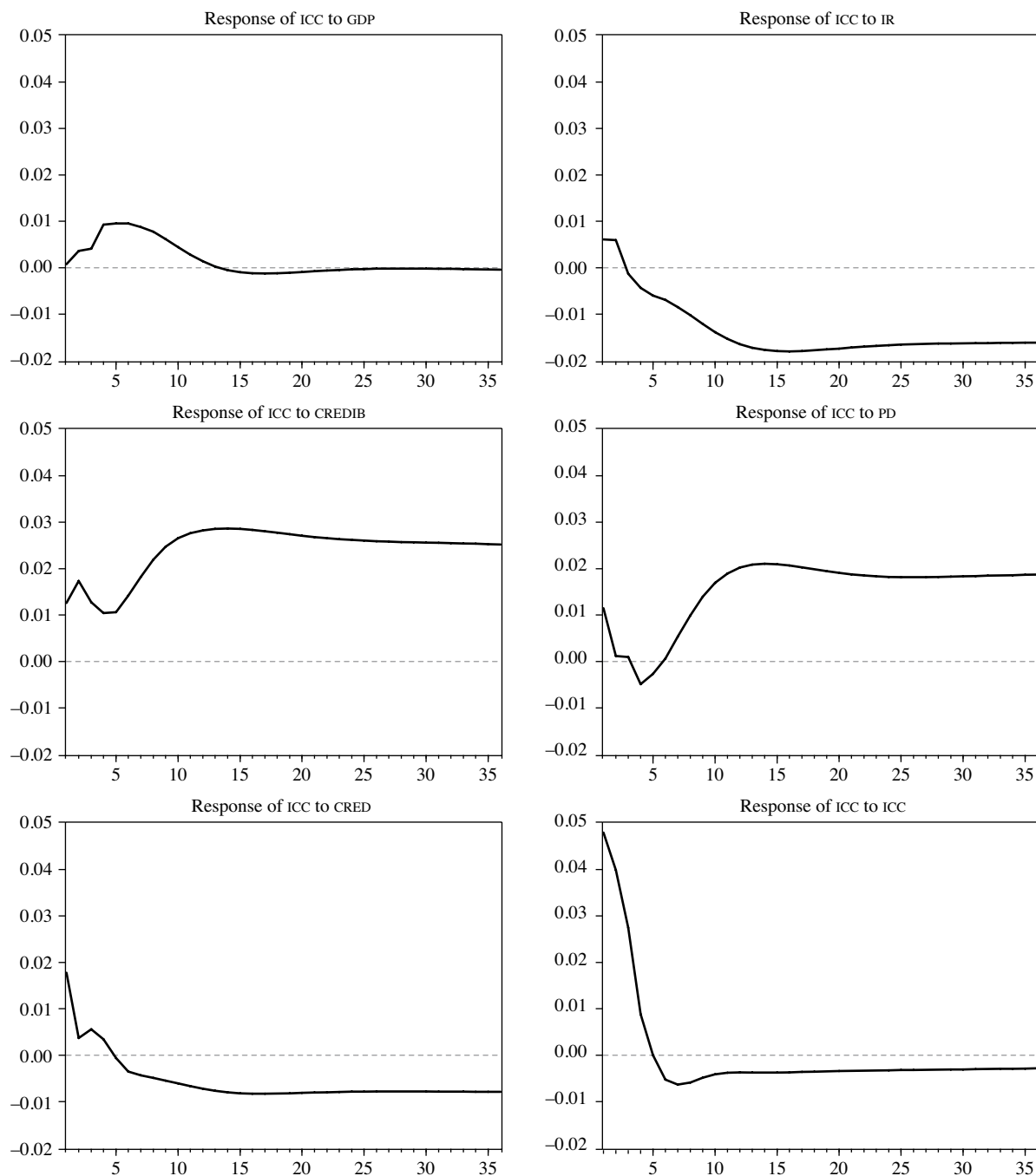
The intercept and trend were included on the basis of the Pantula principle (Harris, 1995). The results presented in table A.3 show that a correct specification is the use of an intercept within the cointegrating vector. The cointegration tests proposed by Johansen (1991) with regard to the significance of the estimated eigenvalues indicate that both trace and maximum eigenvalue statistics reject the non-cointegration hypothesis (see appendix, table A.4). In consequence, there is a long-term equilibrium relationship between the variables under consideration and thus a VEC is estimated.

Vector autoregressive (VAR) estimates are commonly interpreted using impulse-response functions and the standard method uses an “orthogonality assumption”, so that the result may depend on the ordering of variables in the VAR (see Lutkenpohl, 1991). Notwithstanding, in this analysis the variables were ordered in different ways for the impulse-response function analysis, but the results did not change significantly.

On the basis of the above-mentioned methodology, figure 2 shows the results of the generalized impulse-response functions for a time horizon of 36 months. An unexpected positive change in the public debt ratio has a negative and significant effect over time. This result is in agreement with the previous results (constant was statistically significant for all specifications in both methods, OLS and GMM). Furthermore, this outcome

FIGURE 2

Impulse response
(Response to Cholesky One S.D. Innovations)



Source: prepared by the author.

ICC: Index of consumer confidence.

GDP: Gross domestic product.

IR: Real interest rate.

CREDIB: Credibility.

PD: Public debt.

CRED: Credit.

suggests that there is a need to adopt a fiscal policy strategy that reduces the stock of public debt.

Broadly speaking, the results of the VEC estimates are in accordance with those of the OLS and GMM analyses. The impulse-function graph reveals that a positive credibility shock promotes an increase in the ICC that persists over time (see figure 2). This finding strengthens the idea that the use of inflation targeting is an important strategy for driving public expectations. On the other hand, a positive real interest rate and credit volume shock leads to a reduction in the ICC that is not avoided.

IV

Conclusion

The empirical analysis suggests that macroeconomic variables play a substantial role in determining household consumer confidence in the Brazilian economy. The findings reveal that an increase in output or credibility contributes to an improvement in consumer confidence. On the other hand, increases in lending to the private sector and in the real interest rate damage confidence. Public debt, meanwhile, is not an effective instrument for moulding consumer expectations.

The analysis of the impact of a rise in public debt reveals upward pressure on the ICC six months after the shock. This observation is apparently contrary to that found in the OLS and GMM estimations, but the first effect (a fall in the ICC) is in consonance with the results reported in table 1. One explanation for the reversal of the tendency is the existence of a considerable lag between the changes in public debt and their effect on consumer expectations. With regard to GDP, it is observed that a positive shock on this variable leads to an increase in the ICC in the first 12 months.

An important implication of this study is that, in economies such as that of Brazil, following a loose fiscal policy that increases public debt and taking measures to increase the volume of lending to the private sector does not represent a good strategy for improving consumer confidence. What the findings do indicate, though, is that the credibility of the inflation target is a very important driver of consumer expectations. Therefore, developing credibility is crucial for economies that are trying to attain a high level of consumer confidence.

(Original: English)

APPENDIX

TABLE A.1

Unit root tests
(ADF and PP)

Series	ADF			PP		
	Lag	Test	1% critical values	Lag	Test	1% critical values
<i>GDP</i>	2	3.8483	-2.5876	6	6.5517	-2.5872
<i>D(GDP)</i>	0	-4.0171	-3.4944	2	-4.1566	-3.4944
<i>IR</i>	0	-0.8799	-2.5872	0	-0.8799	-2.5872
<i>D(IR)</i>	12	-3.1838	-2.5903	3	-8.2529	-2.5874
<i>CREDIB</i>	0	3.6570	-3.4937	3	-1.5798	-2.5872
<i>D(CREDIB)</i>	0	-7.8249	-3.4944	12	-6.0131	-2.5874
<i>PD</i>	1	-0.9757	-2.5874	5	-0.8732	-2.5872
<i>D(PD)</i>	0	-12.8304	-2.5874	0	-12.8304	-2.5874
<i>CRED</i>	1	-3.0121	-3.4944	2	3.3218	-3.4937
<i>D(CRED)</i>	0	-6.5634	-2.5874	6	-8.8207	-4.0487
<i>ICC</i>	0	-3.5934	-4.0478	2	-3.8044	-4.0478
<i>D(ICC)</i>	0	-10.1815	-2.5874	8	-10.5826	-2.5874

Source: prepared by the author.

N.B.: Augmented Dickey-Fuller test (ADF): the final choice of lag was made on the basis of the Schwarz criterion (SC). No-constant specification or time trend was used for the GDP, IR, D(IR), PD, D(PD), D(CRED) and D(CONF) series. Constant was used for the D(GDP), CREDIB and D(CREDIB) series. Constant and linear trend was used for conf. Phillips-Perron test (PP): lag is the lag truncation chosen for the Bartlett kernel. GDP, IR, D(IR), CREDIB, D(CREDIB), PD, D(PD) and D(CONF). Constant was used for CRED. Constant and linear trend was used for CONF and D(CRED).

TABLE A.2

AIC and HQ criteria for VAR

VAR Order	With constant		No constant	
	AIC	HQ	AIC	HQ
0	39.99192	40.05594		
1	23.13847	23.58657	23.52156	23.90564
2	22.54732 ^a	23.37951 ^a	22.92496 ^a	23.69313 ^a
3	22.83064	24.04691	23.02309	24.17535
4	22.97928	24.57964	23.19122	24.72756
5	22.99014	24.97458	23.16333	25.08375
6	23.17986	25.54838	23.39972	25.70424
7	23.27416	26.02677	23.54158	26.23018
8	23.44275	26.57945	23.65272	26.72540

Source: author's estimates based on the Akaike (AIC) and Hannan-Quinn (HQ) criteria.

^a Denotes lag order selected by the criterion.

VAR: vector autoregression.

TABLE A.3

Number of cointegrating relations

Data trend:	None	None	Linear	Linear	Quadratic
Test type	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Trace	1	3	2	2	1
Max.-eigenvalue	1	1	1	1	0

N.B.: Number of cointegrating relations, by model, selected at 5% level.*

Rank or no. of CES	No intercept	Intercept	Intercept	Intercept	Intercept
	No trend	No trend	No trend	Trend	Trend
0	25.09646	25.09646	25.14402	25.14402	25.17400
1	25.11454	25.13210	25.23447	25.27739	25.35115
2	25.37612	25.42983	25.49587	25.57408	25.60401
3	25.78937	25.73732	25.78879	25.90949	25.96547
4	26.23064	26.19615	26.20376	26.34155	26.37721
5	26.69913	26.68261	26.68347	26.81486	26.80554
6	27.23809	27.21517	27.21517	27.33957	27.33957

Source: prepared by the author.

N.B.: Schwarz information criterion by rank (rows) and model (columns).

CE: Cointegrating equation.

* Critical values based on MacKinnon, Haug and Michelis (1999).

TABLE A.4

Johansen's cointegration tests

Hypothetical number of CES	Eigenv.	Trace			Maximum eigenvalue		
		Trace statistic	5% critical values	Prob. ^a	Max.-eigenvalue statistic	5% critical values	Prob. ^a
R = 0	0.4227	143.2814	103.8473	0.0000	56.5803	40.9568	0.0004
R ≤ 1	0.2497	86.7011	76.9728	0.0075	29.5860	34.8059	0.1841
R ≤ 2	0.2423	57.1151	54.0790	0.0261	28.5801	28.5881	0.0501
R ≤ 3	0.1185	28.5350	35.1928	0.2182	12.9910	22.2996	0.5576
R ≤ 5	0.0938	15.5440	20.2618	0.1968	10.1462	15.8921	0.3212
R ≤ 6	0.0511	5.39783	9.1645	0.2426	5.3978	9.1645	0.2426

Source: prepared by the author.

^a Denotes MacKinnon-Haug-Michelis (1999) p-values.

CE: Cointegrating equation.

Bibliography

- Agénor, P. and M.P. Taylor (1992), "Testing for credibility effects", IMF Staff Papers, vol. 39, No. 3, Washington, D.C., International Monetary Fund, September.
- Cragg, J.G. (1983), "More efficient estimation in the presence of heteroscedasticity of unknown form", *Econometrica*, vol. 51, No. 3, New York, Econometric Society, May.
- Cukierman, A. and A.H. Meltzer (1986), "A theory of ambiguity, credibility, and inflation under discretion and asymmetric information", *Econometrica*, vol. 54, No. 5, New York, Econometric Society, September.
- De Mendonça, H.F. (2007), "Towards credibility from inflation targeting: the Brazilian experience", *Applied Economics*, vol. 39, No. 20, London, Routledge.
- De Mendonça, H.F. and J. Simão Filho (2008), "Macroeconomic effects of Central Bank transparency: the case of Brazil", *Cato Journal*, vol. 28, No. 1, Washington, D.C., Cato Institute.
- (2007), "Economic transparency and effectiveness of monetary policy", *Journal of Economic Studies*, vol. 34, No. 6, Bingley, Emerald.
- De Mendonça, H.F. and V. Vivian (2008), "Public-debt management: the Brazilian experience", *CEPAL Review*, No. 94 (LC/G.2357-P), Santiago, Chile, April.
- Fuhrer, J. (1993), "What role does consumer sentiment play in the US macroeconomy?", *New England Economic Review*, Boston, Federal Reserve Bank of Boston, January-February.
- Hansen, L.P. (1982), "Large sample properties of generalized method of moments estimators", *Econometrica*, vol. 50, No. 4, New York, Econometric Society.
- Harris, R. (1995), "Using cointegration analysis in econometric modeling", London, Prentice Hall.
- Johansen, S. (1991), "Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models", *Econometrica*, vol. 59, No. 6, New York, Econometric Society.
- Ludvigson, S. (2004), "Consumer confidence and consumer spending", *Journal of Economic Perspectives*, vol. 18, No. 2, Nashville, Tennessee, American Economic Association.
- Lutkepohl, H. (1991), "Introduction to multiple time series analysis", Berlin, Springer.
- MacKinnon, J.G., A.A. Haug and L. Michelis (1999), "Numerical distribution functions of likelihood ratio tests for cointegration", *Journal of Applied Econometrics*, vol. 14, No. 5, London, John Wiley & Sons.
- Nahuis, N.J. and W.J. Jansen (2004), "Which survey indicators are useful for monitoring consumption? Evidence from European countries", *Journal of Forecasting*, vol. 23, No. 2, London, John Wiley & Sons.
- Newey, W.K. and K.D. West (1987), "A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix", *Econometrica*, vol. 55, No. 3, New York, Econometric Society.
- Romer, D. (2006), *Advanced Macroeconomics*, New York, McGraw-Hill.
- Sims, C. (1980), "Macroeconomics and reality", *Econometrica*, vol. 48, No. 1, New York, Econometric Society, January.
- Svensson, L. (1999), "How should monetary policy be conducted in an era of price stability?", *Proceedings, Federal Reserve Bank of Kansas City*.
- Wooldridge, J.M. (2001), "Applications of generalized method of moments estimation", *Journal of Economic Perspectives*, vol. 15, No. 4, Nashville, Tennessee, American Economic Association.